Description and operating instructions
INDUSTRIAL line Rail Switch 2

RS2-*TX/*FX(-*)
Order No.
943 ...-001

The Rail Switches
– RS2-3TX/2FX
– RS2-3TX/2FX-SM
– RS2-4TX/1FX
– RS2-4TX/1FX-EEC,
in short RS2-*TX/*FX(-*), are switches especially designed for use in industrial environments. They support ETHERNET 10 MBit/s and Fast ETHERNET 100 MBit/s.

The Rail Switch modules support switched ETHERNET networks in accordance with IEEE standard 802.3 or 802.3u using copper and fiber optic technology. The switch modules are plugged onto the standard DIN rail.

The RS2-3TX/2FX(-SM) modules have three 10/100 MBit/s twisted pair ports (10/100BASE-TX, RJ45 connectors) and two 100 MBit/s fiber optic ports (100BASE-FX, Duplex SC connector).
It is possible to connect up to three DTEs or other TP/TX network segments to the TP/TX ports using twisted pair cabling. Two further DTEs or optical network components can be connected to the fiber ports.

The RS2-4TX/1FX(-EEC) modules have four 10/100 MBit/s twisted pair ports (10/100BASE-TX, RJ45 connectors) and one 100 MBit/s fiber optic port (100BASE-FX, Duplex SC connector).
It is possible to connect up to four DTEs or other TP/TX network segments to the TP/TX ports using twisted pair cabling. One further DTE or optical network component can be connected to the fiber port.

The TP ports support auto negotiation and autopolarity.

RS2-3TX/2FX

RS2-4TX/1FX

RS2-3TX/2FX-SM

RS2-4TX/1FX-EEC

We have checked that the contents of the technical publication agree with the hardware and software described. However, it is not possible to rule out deviations completely, so we are unable to guarantee complete agreement. However, the details in the technical publication are checked regularly. Any corrections which prove necessary are contained in subsequent editions. We are grateful for suggestions for improvement.

We reserve the right to make technical modifications.

Note

We would point out that the content of these operating instructions is not part of, nor is it intended to amend an earlier or existing agreement, permit or legal relationship. All obligations on Hirschmann arise from the respective purchasing agreement which also contains the full warranty conditions which have sole applicability. These contractual warranty conditions are neither extended nor restricted by comments in these operating instructions.

We would furthermore point out that for reasons of simplicity, these operating instructions cannot describe every conceivable problem associated with the use of this equipment. Should you require further information or should particular problems occur which are not treated in sufficient detail in the operating instructions, you can request the necessary information from your local Hirschmann sales partner or directly from the Hirschmann office (address: refer to chapter entitled „Notes on CE identification").

Safety Instructions

This manual contains instructions which must be observed to ensure your own personal safety and to avoid
damage to devices and machinery. The instructions are highlighted with a warning triangle and are shown as
follows according to the degree of endangerment:

Danger!
means that death, serious injury or considerable damage to property **will** result if the appropriate safety measures are not taken.

Warning!
means that death, serious injury or considerable damage to property **can** result if the appropriate safety measures are not taken.

Caution!
means that light injury or damage to property can result if the appropriate safety measures are not taken.

Note: is an important piece of information about the product, how to use the product, or the relevant section of the documentation to which particular attention is to be drawn.

Certified usage

Please observe the following:

Warning
The device may only be employed for the purposes described in the catalog and technical description, and only in conjunction with external devices and components recommended or approved by Hirschmann. The product can only be operated correctly and safely if it is transported, stored, installed and assembled properly and correctly. Furthermore, it must be operated and serviced carefully.

Safety Guidelines Power Supply

☐ Switch the basic devices on only when the case is closed.

Warning!
The devices may only be connected to the supply voltage shown on the type plate.

The devices are designed for operation with a safety extra-low voltage. Thus, they may only be connected to the supply voltage connections and to the signal contact with SELV/PELV voltage circuits with the voltage limitations in compliance with IEC/EN 60950.

☐ For the case where the module is operated with external power supply: Use only a safety extra-low voltage in accordance with IEC 950/EN 60 950/VDE 0805 to power the system.

☐ First of all you connect the protecting line, before you establish the further connections. When you remove connections, you disconnect the protecting line last.

Safety Guidelines Shielding Ground

Note: The shielding ground of the connectable twisted pairs lines is connected to the front panel as a conductor.

☐ Beware of possible short circuits when connecting a cable section with conductive shielding braiding.

Safety Guidelines Housing

Warning!
Only technicians authorized by Hirschmann are permitted to open the housing.

Note: The device is grounded via the separated ground screw. It is located on the left under the front panel.

☐ Make sure that the electrical installation meets local or nationally applicable safety regulations.

Warning!
The ventilation slits must not be covered so as to ensure free air circulation.

The distance to the ventilation slots of the housing has to be a minimum of 10 cm.

Never insert pointed objects (thin screwdrivers, wires, etc.) into the inside of the subrack! This especially applies to the area behind the socket connectors. Failure to observe this point may result in injuries caused by electric shocks.

Note: According to EN 60950 the device may only be operated in a fire protective housing.

Note: The housing has to be mounted in upright position.

Safety Guidelines Environment

Warning!
The device may only be operated in the listed ambient temperature range at the listed relative air humidity (non-condensing).

☐ The installation location is to be selected so as to ensure compliance with the climatic limits listed in the Technical Data.

Staff qualification requirements

Note: Qualified personnel, as understood in this manual and in the warning signs, are persons who are familiar with the setup, assembly, startup, and operation of this product and are appropriately qualified for their job. This includes, for example, those persons who have been:

– trained or directed or authorized to switch on and off, to ground and to label power circuits and devices or systems in accordance with current safety engineering standards

– trained or directed in the care and use of appropriate safety equipment in accordance with the current standards of safety engineering

– trained in providing first aid.

General Safety Instructions

☐ This device is electrically operated. Adhere strictly to the safety requirements relating to voltages applied to the device as described in the operating instructions!

⚠ **Warning!**
Failure to observe the information given in the warnings could result in serious injury and/or major damage.

Only personnel that have received appropriate training should operate this device or work in its immediate vicinity. The personnel must be fully familiar with all of the warnings and maintenance measures in these operating instructions.

Correct transport, storage, and assembly as well as careful operation and maintenance are essential in ensuring safe and reliable operation of this device.

☐ These products are only to be used in the manner indicated in this version of the "Description and Operating Instructions".

☐ Particular attention is to be paid to all warnings and items of information relating to safety.

⚠ **Warning!**
Any work that may have to be performed on the electrical installation should be performed by fully qualified technicians only.

Based specifications and standards:

The RS2-3TX/2FX, RS2-3TX/2FX-SM, RS2-4TX/1FX devices fulfil the following specifications and standards:
– EN 61000-6-2:1999 Generic standards – Immunity for industrial environments
– EN 55022:1998 – Information technology equipment – Radio disturbance characteristics
– EN 60950:1997 – Safety of Information Technology Equipment (ITE)
– EN 61131-2:1994 – Programmable Controllers
– CFR-47 Part 15:1997 – Code of Federal Regulations
– UL 508:1998 – Underwriters Labratories Inc. Standard for Safety

⊂ ∈ Notes on CE identification

The devices comply with the regulations of the following European directive:

89/336/EEC
Council Directive on the harmonization of the legal regulations of member states on electromagnetic compatibility (amended by Directives 91/263/EEC, 92/31/EEC and 93/68/EEC).

The EU declaration of conformity is kept available for the responsible authorities in accordance with the above-mentioned EU directives at:

Hirschmann Electronics
GmbH & Co. KG
Automation and Network Solutions
Stuttgarter Straße 45-51
D-72654 Neckartenzlingen
Telephone ++49-7127-14-1538

The product can be used in the residential sphere (residential sphere, business and trade sphere and small companies) and in the industrial sphere.
– Interference immunity:
  EN 61000-6-2:1999
– Radio interference level:
  EN 55022:1998 Class A

⚠ **Warning!**
This is a Class A device. This equipment may cause radio interference if used in a residential area; in this case it is the operator´s responsibility to take appropriate measures.

The precondition for compliance with EMC limit values is strict adherence to the construction guidelines specified in this description and operating instructions.

FCC Note:

This equipment has been tested and found to comply with the limits for a Class A digital device, persuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

♲ **Recycling Note:**
After its use, this product has to be processed as electronic scrap and disposed of according to the prevailing waste disposal regulations of your community / district / country / state.

1. Functional description

The 10/100BASE-T(X) ports of an RS2-*TX/*FX(-*) represent a terminal connection for the connected LAN segment. You can connect single devices or complete network segments.

1.1 FRAME SWITCHING FUNCTIONS
Store and Forward
All data received by the RS2-*TX/*FX(-*) from the system bus or at the ports is stored and checked for validity. Invalid and defective frames (> 1,518 bytes or > 1,522 bytes with VLAN frames, or CRC error) as well as fragments (< 64 bytes) are discarded. The RS2-*TX/*FX(-*) forwards the valid frames.

Multi address capability
An RS2-*TX/*FX(-*) learns all source addresses per port. Only packets with
– unknown addresses
– addresses learnt at this port
– a multi/broadcast address
in the destination address field are sent to this port.
An RS2-*TX/*FX(-*) learns up to 1,000 addresses. This becomes necessary if more than one terminal device is connected to one or more ports. In this way several independent subnetworks can be connected to an RS2-*TX/*FX(-*).

Learnt addresses
An RS2-*TX/*FX(-*) monitors the age of the learned addresses. The RS2-*TX/*FX(-*) deletes address entries from the address table which exceed a certain age (300 seconds).
Note: Restarting deletes the learned address entries.

Tagging (IEEE 802.1Q)
The IEEE 802.1 Q standard designates the VLAN tag to be included in a MAC data frame for the VLAN and prioritizing functions. The VLAN tag consists of 4 bytes (2 bytes tag protocol identifier TPID, 2 bytes tag control information TCI). It is inserted between the source address field and the type field. Data packets with a VLAN tag are transmitted unchanged by the RS2-*TX/*FX(-*).

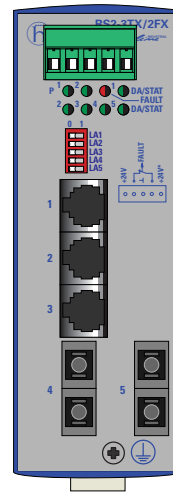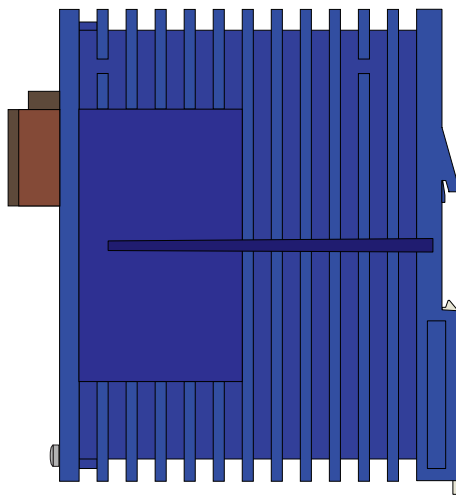## 1.2 SPECIFIC FUNCTIONS OF THE TP/TX INTERFACE
Link control
The RS2-*TX/*FX(-*) monitors the connected TP/TX line segments for short-circuits or interrupts using regular Idle signals in accordance with IEEE standard 802.3 10/100BASE-T/TX. The RS2-*TX/*FX(-*) does not transmit any data to a TP/TX segment from which it does not receive an Idle signal.

Note: A non-occupied interface is assessed as a line interrupt. The TP/TX line to terminal equipment which is switched off is likewise assessed as a line interrupt as the de-energised bus coupler cannot transmit Idle signals.

Auto polarity exchange
If the receive line pair is incorrectly connected (RD+ and RD- switched) polarity is automatically reversed.

RS2-3TX/2FX
RS2-3TX/2FX-SM
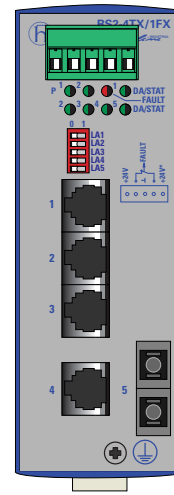
RS2-4TX/1FX
RS2-4TX/1FX-EEC

Fig. 1: Overview display elements and interfaces of the RS2-*TX/*FX(-*)

1.3 SPECIFIC FUNCTIONS OF THE F/O INTERFACE
Link control
The RS2-*TX/*FX(-*) monitors the connected F/O line for interrupts using idle signals during frame pauses in accordance with IEEE standard 802.3 100BASE-FX. The RS2-*TX/*FX(-*) transmits no data to an F/O line from which it is receiving no idle signal.
Low Light Detection: If the optical input power decreases below the low light threshold the transmit and receive path will be disabled for data and the idle signal will be transmitted.

Far-End Fault
The optical transmission distance of the RS2-*TX/*FX(-*) can be monitored in receiving direction as well as in transmitting direction, if the other side also supports Far-End Fault. If the other side does not support Far-End Fault, the optical transmission distance is monitored only in receiving direction.
Far-End Fault is sent, if the optical input power at the optical port has fallen under the low light level. If Far-End Fault is reveived, the link stays inactive (DA/STAT LED dark).

1.4 FURTHER FUNCTIONS AND FEATURES
Reset
The RS2-*TX/*FX(-*) will be reset by the following action:
– input voltages fall below a threshold

After a reset the following action is carried out:
– initialization

1.5 DISPLAY ELEMENTS
Equipment status
These LEDs provide information about statuses which affect the function of the entire RS2-*TX/*FX(-*).
P1 – Power 1 (green LED)
– lit: – supply voltage 1 present
– not lit: – supply voltage 1 less than 9.6 V

P2 – Power 2 (green LED)
– lit: – supply voltage 2 present
– not lit: – supply voltage 2 less than 9.6 V

FAULT (Red LED)
– lit: – Indicator contact indicates an error
– not lit: – no error

Port Status
These LEDs display port-related information.
DA/STAT 1 to 5 – Data, Link status
(green LED)
– not lit: – no valid link
– flashes: – data activity
– lit: – valid link

LEDs for power (P1 and P2)   FAULT LED

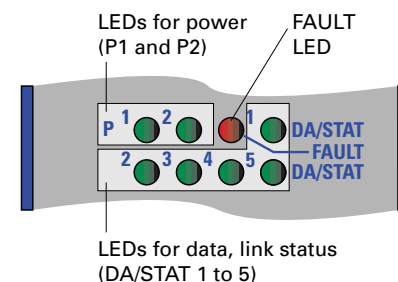LEDs for data, link status (DA/STAT 1 to 5)

Fig. 2: Display elements of the RS2-*TX/*FX(-*)

1.6 INTERFACES
10/100 MBit/s connection (TP port)
Three (RS2-4TX/1FX(-EEC): four) 10/100 Mbit ports (8-pin shielded R45 sockets) allow DTEs or independent network segments complying with the standards IEEE 802.3 100BASE-TX / 10BASE-T to be connected. These ports support autonegotiation and the autopolarity function.

The socket casings are electrically connected to the front panel of the RS2-*TX/*FX(-*).The pin configuration complies with MDI-X.

– **Pin configuration** of the RJ45 socket:
  – Transmit Data +   TX+ : pin 3,
  – Transmit Data -   TX- : pin 6

– Receive Data +   RX+ : pin 1
– Receive Data -   RX- : pin 2
– Remaining pins: : not used.

```
n.c.   Pin 8
n.c.   Pin 7
TD-    Pin 6
n.c.   Pin 5
n.c.   Pin 4
TD+    Pin 3
RD-    Pin 2
RD+    Pin 1
```
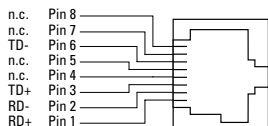
Fig. 3: Pin configuration of an TP/TX interface

100 Mbit/s connection (FX port)
The 100 MBit/s ports of the RS2-*TX/*FX(-*) (one port on the RS2-4TX/1FX(-EEC), two ports on the RS2-3TX/2FX(-SM)) support the IEEE 802.3 100BASE-FX FDX standard. They use an duplex SC connector. Each 100 MBit/s port allows one further DTE or an optical network component to be connected.

5pin terminal block
The supply voltage and the indicator contact are connected via a 5pin terminal block. If the terminal block is fitted the wrong way round, the device will still work correctly.

⚠ **Warning!**
The RS2-*TX/*FX(-*) equipments are designed for operation with a safety extra-low voltage.Thus, they may only be connected to the supply voltage connections and to the signal contact with SELV/PELV voltage circuits with the voltage limitations in compliance with IEC/EN 60950.

– **Voltage supply**: Redundant voltage supplies are supported. Both inputs are decoupled. There is no load distribution. With redundant supply, the power pack supplies the RS2-*TX/*FX(-*) only with the higher output voltage. The supply voltage is electrically isolated from the housing.
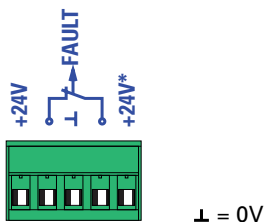
```
        FAULT
+24V  ⊥  +24V*
```

⊥ = 0V

Fig. 5: Pin configuration of 5 pin terminal block

Ground connection
The RS2-*TX/*FX(-*) is grounded via a separate screw connection.

1.7 BEDIENELEMENTE
5-pole DIP switch
(Suppressing the link states)
With a DIP switch on the front panel of the RS2-*TX/*FX(-*) the indication of the link states by the indicator contact can be suppressed port by port. Using the switches LA1 to LA5, the indication of the link states can be suppressed.

Switch position „ON": the indication of the link state is not suppressed, that is the indicator contact indicates the unvalid link. State of delivery: LA1 to LA5 in position „ON" (position 1).
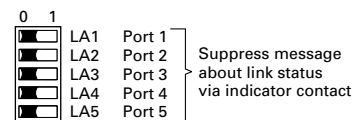
```
 0   1
      LA1   Port 1 ┐
      LA2   Port 2 │ Suppress message
      LA3   Port 3 ├ about link status
      LA4   Port 4 │ via indicator contact
      LA5   Port 5 ┘
```

Abb. 6: 5-poliger DIP-Schalter zur Maskierung der Linkstati-Meldung

2. Configuration

2.1 CONNECTING DTE AND OTHER NETWORK SEGMENTS
It is possible to connect up to three DTEs or other TP/TX network segments to the 10/100 Mbit/s ports of the RS2-3TX/2FX(-SM) using twisted pair cabling. Two further data terminal equipments or optical network components can be connected at 100 Mbit/s to the optical ports using fiber optic cable.
It is possible to connect up to four DTEs or other TP/TX network segments to the 10/100 Mbit/s ports of the RS2-4TX/1FX(-EEC) using twisted pair cabling. One further

RS2-FX/FX   RS2-FX/FX

100 Mbit/s
HIPER-Ring

100 Mbit/s

10 Mbit/s

robot

user
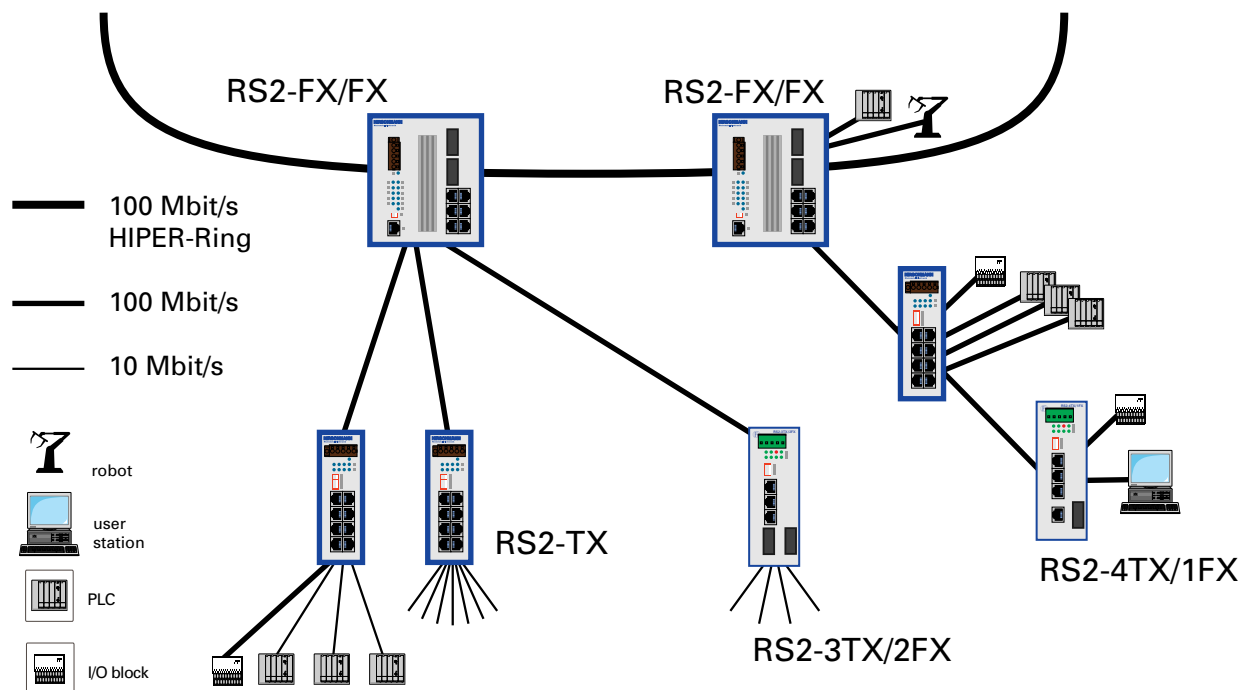station

PLC

I/O block

RS2-TX

RS2-3TX/2FX

RS2-4TX/1FX

Fig. 4: Configuration with RS2-*TX/*FX(-*): Connection of up to 4 data terminal equipments (4 on RS2-4TX/1FX(-EEC), 3 on RS2-3TX/2FX(-SM)) or further segments via TP/TX as well as connection via fiber optic cable with up to 2 optical ports (1 on RS2-4TX/1FX(-EEC), 2 on RS2-3TX/2FX(-SM)).

data terminal equipment or optical network component can be connected at 100 Mbit/s to the optical port using fiber optic cable. (ref. Fig. 4).

3. Assembly, startup procedure and dismantling

3.1 UNPACKING, CHECKING
☐ Check whether the package was delivered complete (see scope of delivery).
☐ Check the individual parts for transport damage.

⚠ **Warning!**
Use only undamaged parts!

3.2 ASSEMBLY
The equipment is delivered in a ready-to-operate condition. The following procedure is appropriate for assembly:

☐ Pull the terminal block off the RS2-*TX/*FX(-*) and wire up the supply voltage.
☐ Fit the RS2-*TX/*FX(-*) on a 35 mm standard DIN rail to DIN EN 50 022.
☐ Attach the upper snap-on slide bar of the RS2-*TX/*FX(-*) to the standard DIN rail and press it down until it locks into position.
☐ Fit the signal lines.

Notes:
– The front panel of the RS2-*TX/*FX(-*) is grounded via a separate ground connection.

– Do not open the housing.
– The shielding ground of the twisted pair cables is electrically connected to the front panel.
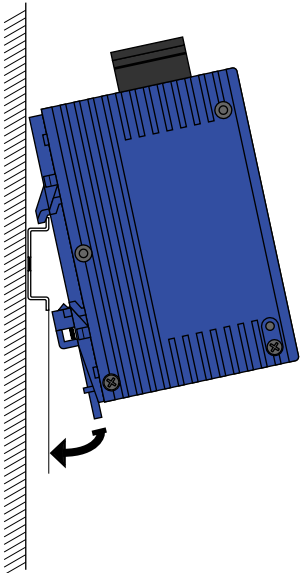

Fig. 6: Assembling the RS2-*TX/*FX(-*)

3.3 STARTUP PROCEDURE

☐ You start up the RS2-*TX/*FX(-*) by connecting the supply voltage via the 5-pin terminal block.

3.4 DISMANTLING
☐ To take the RS2-*TX/*FX(-*) off the ISO/DIN rail, insert a screwdriver horizontally under the housing into the locking slide, pull it (without tipping the screwdriver) downwards and lift the RS2-*TX/*FX(-*) upwards.

4. Further support

In the event of technical queries, please talk to the Hirschmann contract partner responsible for looking after your account or directly to the Hirschmann office. You can find the addresses of our contract partners
– on the Internet
  (http://www.hirschmann.de).

Our support line is also at your disposal: Tel. +49(7127) 14-1538 (Fax -1542)

Answers to Frequently Asked Questions can be found on the Hirschmann internet site

www.hirschmann.de

The FAQs are located under „Service" in the Automation and Network Solutions section.

5. Technical data

General data

Operating voltage	NEC Class 2 power source 24 VDC (-25% to +30%) safety extra-low voltage (SELV/PELV) (redundant inputs decoupled)
Buffer time	min. 10 ms at 24 VDC
Potential difference between input voltage and housing	Potential difference to input voltage, +24 VDC: 32 VDC Potential difference to input voltage, ground: -32 VDC
Current consumption	RS2-3TX/2FX(-SM): 170 mA typ., RS2-4TX/1FX(-EEC): 110 mA bei 24 VDC typ., no link RS2-3TX/2FX(-SM): 250 mA max., RS2-4TX/1FX(-EEC): 200 mA max. at 24 VDC, 5 ports fully loaded
Overload current protection at input	non-changeable fuse
Dimensions W x H x D	47 mm x 135 mm x 111 mm
Weight	320 g
Ambient temperature	0 °C to + 60 °C (RS2-3TX/2FX, RS2-3TX/2FX-SM, RS2-4TX/1FX) -20°C to +70°C (RS2-4TX/1FX-EEC, expanded temperature bounds)
Storage temperature	-25 °C to + 70 °C
Humidity	up to 95% (non condensing)
Atmospheric pressure	min. 79 kPa
Laser protection	class 1 in compliance with EN 60825
Protection type	IP 20
Radio disturbance characteristics	EN 55022 Class A, CFR-47 Part 15 Class A
Immunity	Electrostatic discharge	EN 61000-4-2 level 3
	Electromagnetic fields	EN 61000-4-3 level 3
	Bursts	EN 61000-4-4 level 3
	Surge	EN 61000-4-5
	Conducted disturbance	EN 61000-4-6 level 3
Mechanical service conditions	Vibrations	IEC 60068-2-6 Test Fc
	Shocks	IEC 60068-2-27 Test Ea

Network size

TP port 10BASE-T

Length of a twisted pair segment	approx. 100 m

TX port 100BASE-TX

Length of a twisted pair segment	approx. 100 m

F/O port

Optical output power		
Graded-index fiber 50/125 µm (average)	min. -23,5 dBm	max. -17,0 dBm
Graded-index fiber 62,5/125 µm (average)	min. -20,0 dBm	max. -14,0 dBm
E10/125µm (average), RS2,3TX/2FX-SM	min. -15,0 dBm	max. -8,0 dBm
Optical input power (average)	min. -31,0 dBm	

F/O line length (example)

50/125 µm fiber	ca. 5 km	(fiber data: 1.0 dB/km, 800 MHz∗km)
62,5/125 µm fiber	ca. 4 km	(fiber data: 1.0 dB/km, 500 MHz∗km)
10/125 µm singlemode fiber	ca. 20 km	(fiber data: 1300 nm, 0.4 dB/km)

Interfaces

RS2-3TX/2FX(-SM):	3 TP/TX ports	RJ45 sockets, 10/100 MBit/s
	2 FX ports	Duplex SC connector, 100 MBit/s
RS2-4TX/1FX(-EEC)	4 TP/TX ports	RJ45 sockets, 10/100 MBit/s
	1 FX port	Duplex SC connector, 100 MBit/s

Displays

Equipment status	1 x green LED	**P1** – power 1, supply voltage 1 present
	1 x green LED	**P2** – power 2, supply voltage 2 present
	1 x red LED	**FAULT** – indicator contact indicates an error
Port status	5 x green LED	**DA/STAT 1 to 5** – data, link status

Scope of delivery

Rail Switch RS2-3TX/2FX(-SM) or RS2-4TX/1FX(-EEC) incl.
   terminal block for supply voltage
   description and operating instructions

Order number	
Rail Switch RS2-3TX/2FX	943 752-001
Rail Switch RS2-3TX/2FX-SM	943 753-001
Rail Switch RS2-4TX/1FX	943 754-001
Rail Switch RS2-4TX/1FX-EEC	943 765-001

Accessories

ETHERNET manual	943 320-011
Rail Power Supply RPS 60	943 662-001
Rail Power Supply RPS 120	943 662-011

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